U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Rorippa subumbellata

Common Name:

Tahoe Yellow cress

Lead region:

Region 8 (California/Nevada Region)

Information current as of:

04/11/2012

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

___ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status

___ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species

___ Range is no longer a U.S. territory

___ Insufficient information exists on biological vulnerability and threats to support listing

___ Taxon mistakenly included in past notice of review

___ Taxon does not meet the definition of "species"

___ Taxon believed to be extinct

___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 12/27/2000

90-Day Positive:05/04/2004

12 Month Positive:05/04/2004

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. TheProgress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: California, Nevada
- **US Counties**:County information not available
- **Countries**:Country information not available

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: California, Nevada
- **US Counties**: El Dorado, CA, Placer, CA, Carson City, NV, Douglas, NV, Washoe, NV
- **Countries**: United States

Land Ownership:

Populations occur on lands under management by the U.S. Forest Service (USFS) (27 percent); California Tahoe Conservancy (CTC), California Department of Parks and Recreation (CDPR), Nevada Division of State Parks (NDSP), and other county and city parks (31 percent); and private landowners (42 percent). The actual acreage of occupied sites varies with lake elevation.

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Biological Information

Species Description:

Rorippa subumbellata Rollins (Tahoe yellow cress) is a member of the mustard family (Brassicaceae) known only from the shores of Lake Tahoe (Stuckey 1972, p. 297). The species is a decumbent, somewhat fleshy, herbaceous perennial that branches profusely (Figure 1). An underground system of horizontal roots results in clonal growth (Stuckey 1972, pp. 296297). Leaves are generally oblong and deeply pinnately lobed. The inflorescences are umbel-like and elongate. Flowers are yellow, and flowering occurs between late May and late October. Fruit and seed development is continuous during the flowering period, truncated by inundation or the first winter frost. Fruits are typically oblong and weakly inflated.

Figure 1. *Rorippa subumbellata* (Tahoe yellow cress) in flower. Photo credit: J. Fraser, Service.

Taxonomy:

Numerous collections of *Rorippa subumbellata* were identified as *Rorippa sinuata* (Nutt.) Hitchc. (spreading yellow cress) or its synonyms until it was recognized as a distinct species restricted to the shores of Lake Tahoe by Rollins (1941, pp. 177178; Stuckey 1972, pp. 296297). The earliest collection of what was later to be known as *R. subumbellata* was by E.L. Greene sometime prior to 1891 (Stuckey 1972, p. 297). Rollins (1993a, pp. 435; Rollins 1993b, 767), in a treatment included in the latest version of the Jepson Manual, maintained *R. subumbellata* as a distinct species. Current information on taxonomic validity was reviewed on the Jepson Flora Project website; *Rorippa subumbellata* is the accepted name for a taxon native to California (Jepson Online Interchange; *http://ucjeps.berkeley.edu/interchange.html*, accessed on March 1, 2011). We have carefully reviewed the available taxonomic information to conclude the species is a valid taxon.

Habitat/Life History:

Rorippa subumbellata occurs on sandy substrates, in silty soils among boulders, along lake margins, near stream mouths, in organically enriched dune slacks, and in back-beach depressions in naturally dynamic environments (Knapp 1979a, p. 4; Ferreira 1987, p. 22; Pavlik et al. 2002, pp. 2123). Physical processes such as wave action, lake level fluctuations, and the erosive forces of the wind heavily influence substrate characteristics. Soil moisture, an important determinant of plant species distribution, is strongly influenced by lake level (Ferriera 1987, pp. 6780). Soil moisture also influences the colonization of *R. subumbellata* sites by other plant species that may compete with it for resources (Ferriera 1987, p. 81; California State Lands Commission (CSLC) 1998, pp. 3233).

Data collected over the last 25 years indicate a statistically significant relationship between lake level and site occupancy by *Rorippa subumbellata* (Pavlik et al. 2002, pp. 4246; Service 2004, p. 9). *Rorippa subumbellata* can persist over long periods of time because it has adopted a metapopulation dynamic in which extirpation is countered by colonization (Pavlik et al. 2002, p. 27). New, unoccupied sites can be colonized and old occupied sites can be extirpated or recolonized, based on habitat availability (i.e., lake level). Besides site availability, the probability of colonization or recolonization is also determined by attributes of the species (propagule longevity and mobility), and by the nature of the migration path (dispersal agents, complexity) (Pavlik et al. 2002, p. 27). The probability of extirpation is determined by plant attributes (propagule longevity in situ, plant survivorship and reproductive output, stress tolerance), and site attributes (disturbance regime, habitat abundance and quality).

Historical Range/Distribution:

Rorippa subumbellata is endemic to the shores of Lake Tahoe in California and Nevada. Complete, rangewide surveys for *R. subumbellata* populations were not conducted prior to 1979, thus, definitive information on the historical distribution of *R. subumbellata* is lacking. Survey efforts have been undertaken periodically since 1979 to determine rangewide distribution, status, and population trends of *R. subumbellata* (Knapp 1979a, pp. 110; 1979b, pp. 17; 1980, pp. 110; Ferreira 1987, pp. 1336; Pavlik et al. 2002, pp. 2324). Counting methods varied among surveyors, and seasonal timing of surveys was found to influence plant numbers observed, so in 2002 a standardized survey method was implemented (Pavlik et al. 2002, p. A45). Data from the surveys demonstrate that *R. subumbellata* distribution fluctuates yearly in response to lake level, which determines the amount of exposed habitat (Figure 2). When the lake level is high (6,226 feet (ft) (1,897 meters (m)) or above), many sites are inundated and unavailable for that years plant growth; when the lake level is low (below 6,226 ft (1,897 m)), more habitat is exposed and available for colonization (Figure 3).

Figure 2. *Rorippa subumbellata* sites at Lake Tahoe, California and Nevada (Pavlik et al. 2002, p. 13); lake shown in gray, black line is the lakes watershed boundary.

Figure 3. Surface elevation of Lake Tahoe and number of *Rorippa subumbellata* sites occupied by survey year (BMP Ecosciences 2011, unpubl. data) (solid blue line = lake level in feet Lake Tahoe Datum (LTD)). The number of sites occupied each year is based on site name reconciliation and some annual totals may not agree with numbers in earlier reports.

In 1993, lake elevation averaged 6,223 ft (1,897 m) and plants were documented at 37 locations (BMP Ecosciences 2011, unpubl. data). During higher lake levels in subsequent years, the number of occupied sites declined, although not entirely in response to habitat inundation since some populations were absent from

higher elevation sites that were not inundated. In 1995, only 8 of the 30 generalized locations known from 1993 were occupied (CSLC 1998, p. 29). Lake-wide surveys were not conducted in 1996, but *Rorippa subumbellata* was present at five sites considered most likely to support plants (CSLC 1998, p. 29). Between 1997 and 2000 the species was present at only 817 of an average of 42 sites surveyed each year during this period of high lake levels (BMP Ecosciences 2011, unpubl. data).

Lake levels began to recede in 1999, and by 2001 the lake elevation was near the natural rim, exposing hundreds of acres of habitat. In 2001, *Rorippa subumbellata* was present at 29 of 52 sites surveyed, up from 12 occupied sites the previous year; 7 of the sites at which the species was observed were located in areas that had been submerged during annual surveys dating back to 1997 (CSLC 2002, p. 3; BMP Ecosciences 2011, unpubl. data). In 2002, when the lowest lake levels since 1994 were recorded, *R. subumbellata* was present at 40 of the 57 sites surveyed (BMP Ecosciences 2011, unpubl. data). Lake levels remained low in 2003 and 2004, when plants were present at 46 of 61 sites surveyed and 47 of 61 sites surveyed, respectively (Service 2004, p. 4; BMP Ecosciences 2005, p. 3; 2011, unpubl. data).

The lake level was nearly 2 ft (0.6 m) higher during the 2005 survey and many areas exposed in previous years were submerged at the time of the surveys. *Rorippa subumbellata* was present at 47 of 56 sites surveyed (BMP Ecosciences 2006, p. 4; 2011, unpubl. data). In 2006, the lake level was 3 ft (0.9 m) higher than the previous year and plants were present at only 24 of 61 sites surveyed (BMP Ecosciences 2007, p. 8; 2011, unpubl. data). The lake level dropped back to the 2005 level in 2007 and continued to fall in 2008 and 2009 when it was at an elevation of 6,224.1 ft (1,897.1 m) and 6,223.5 ft (1,896.92 m), respectively, during the survey periods. As a consequence, *R. subumbellata* was present at 30 of 61 sites surveyed in 2007 (BMP Ecosciences 2008, p. 11), 43 of 59 sites surveyed in 2008 (BMP Ecosciences 2009, p. 10), and 46 of 61 sites surveyed in 2009 (BMP Ecosciences 2010, p. 21; 2011, unpubl. data). Another consecutive low water year in 2010 kept the lake level at an elevation of 6,224.6 ft (1,897.3 m); thus, surveys were not conducted (see Description of Monitoring). In 2011, the lake level was 6,228.4 ft (1,898.4 m); 3.8 ft (1.2 m) higher than in 2010 and plants were present at only 25 of the 59 sites surveyed (Figure 4; BMP Ecosciences 2011, unpubl. data).

Current Range Distribution:

The general distribution of *Rorippa subumbellata* at Lake Tahoe is shown in Figure 2. The current range of the species, however, has to be evaluated within the context of the current understanding of its metapopulation dynamics (Pavlik et al. 2002, pp. 2737). Given the complexity of this metapopulation dynamic, the unpredictability of where colonization and extirpation will occur, and the close relationship between populations and lake level, the entire shoreline and adjacent beach and back beach habitats of Lake Tahoe, as well as the mouths of streams that flow into Lake Tahoe must be considered within the current range and distribution of the species. Within this range, potentially suitable habitat has been defined as any parcel containing 30 percent sand in a Tahoe Regional Planning Agency (TRPA) 19931994 shorezone study (Pavlik et al. 2002, p. 65). The 2011 distribution of *R. subumbellata* is shown in Figure 4.

Figure 4. *Rorippa subumbellata* survey sites and occurrences in 2011 at Lake Tahoe, California and Nevada.

Population Estimates/Status:

Vegetative reproduction in *Rorippa subumbellata* prevents a count of the actual number of individuals; therefore, the aboveground portion of the plant (referred to as stems) is counted (CSLC 1998, p. 38; Pavlik et al. 2002, p. 18). Over time, the number of stems at each site has ranged from one into the thousands. While some sites consistently support hundreds of stems, depending upon lake level, many sites typically support very few plants. Approximately 27,522 stems were counted or estimated at 46 sites in 2009 (BMP Ecosciences 2010, pp. 1023), whereas during the 2006 annual survey when lake levels were high, the total estimated number of stems was 4,560 at 24 sites (BMP Ecosciences 2007, pp. 813). These data (Table 1) demonstrate the natural fluctuations in the number of individual stems of *R. subumbellata* are a function, in part, of lake elevation and available habitat (Pavlik et al. 2002, p. 49).

Table 1. Population estimates of *Rorippa subumbellata* by year (BMP Ecosciences 2002 to 2011; 2011, unpubl. data). During 2010, the lake level remained low, so sites were not surveyed (see Description of Monitoring).

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

Rorippa subumbellata occurs in a dynamic environment influenced by both natural processes and human activities. Habitat occurrence and suitability are shaped by physical processes such as fluctuations in lake elevation, wave-induced beach erosion, and changes in stream channel orientation, all of which may eliminate or create suitable substrates for plant growth (CSLC 1998, p. 32; Pavlik et al. 2002, pp. 2023). Substrate moisture also influences the occurrence of *R. subumbellata*, as well as competition with other plant species for space, light, nutrients, and other plant requirements (Ferreira 1987, pp. 3135). Under natural conditions, R. subumbellata is apparently tolerant of the dynamic nature of its habitat and adapted for survival in a disturbance regime. However, the habitat conditions are now determined in part by management of the lake level for water supply purposes (CSLC 1998, p. 32). In addition, most *R. subumbellata* sites are used for commercial and public purposes and are affected directly and cumulatively by various activities such as recreation, erosion control, marina developments, and pier construction (CSLC 1998, pp. 3233; Pavlik et al. 2002, pp. 4243).

Water Management

Operation of the Lake Tahoe Dam controls the water level in Lake Tahoe and flows in the Truckee River downstream and is in accordance with water rights and prior court decrees. The 1915 Truckee River General Electric Decree gave the Bureau of Reclamation (BOR) the right to operate the Lake Tahoe Dam and control the top 6.1 ft (1.9 m) of water storage in Lake Tahoe (U.S. Department of the Interior and State of California (USDI/CA) 2004, p. 19). Operation of the Lake Tahoe Dam must satisfy the 1944 Orr Ditch Decree water rights, maintain minimum Floriston rates, and comply with flood control and dam safety requirements (USDI/CA 2004, pp. 341 to 344). Releases from the dam are in accordance with the 1935 Truckee River Agreement, which prevents the lake from exceeding an elevation of 6,229.1 ft (1,898.6 m) above mean sea level (USDI/CA 2004, p. 19). A Federal action to modify operations of the Truckee River reservoirs through implementation of the Truckee River Operating Agreement (TROA) has been negotiated by the Secretary of the Interior in accordance with subsection 205(a) of the Truckee-Carson-Pyramid Lake Water Rights Settlement Act of 1990 (Public Law 101618). TROA is intended to supersede the 1935 Truckee River Agreement and would allow for additional storage, exchange, and trade of water in the upstream reservoirs of California (United States of America v. Orr Water Ditch Co. et al. 2011, p. 4).

Modifying operations of Truckee River reservoirs could influence *Rorippa subumbellata* by altering lake

level dynamics and changing the amount of available shore zone habitat. If lake levels were consistently maintained at high levels, increases in recreation in the reduced available habitat may occur (CLSC 1998, p. 33). In addition, during high lake level years, wetland species colonize the beaches and temporarily displace R. subumbellata (CSLC 1998, p. 32; Pavlik et al. 2002, p. 57). If high lake levels are maintained and the cyclic return to lower lake levels is not permitted, habitat suitable for *R. subumbellata* could be permanently altered by other colonizing species.

An analysis of potential effects from implementation of TROA has been completed, including an analysis of potential changes in the level of Lake Tahoe and possible effects on *Rorippa subumbellata*. The analysis shows that implementation of TROA would result in a growing season average of less than 1 percent more habitat available under drought conditions when compared to current conditions (No Action). Under TROA in median hydrologic conditions, about 6 acres (ac) (2.4 hectares (ha)) less are available than under current conditions, and 20 ac (8.1 ha) less would be available under No Action. In wet hydrologic conditions under TROA and No Action, 2 ac (0.8 ha) more habitat than under current conditions are available (USDI/CA 2008, p. 3286). The effect of TROA on *R. subumbellata* was deemed to not be significant (USDI/CA 2008, pp. 3284 to 3291). A Federal final rule on TROA was promulgated and took effect on January 5, 2009 (73 FR 74031, December 5, 2008); however, actual implementation of TROA has not taken place due to several pending court cases (Service 2009, pp. 3839; 2012, pp. 1920; *United States of America v. Orr Water Ditch Co. et al. 2011*, p. 4).

Recreation

Recreational use of the public beaches at Lake Tahoe constitutes the greatest threat to Rorippa subumbellata and its habitat. Many public beaches, which support the largest occurrences of the species, are filled to capacity during the summer months; and heavy recreational use results in compaction and mixing of sandy substrates and destruction of the armor layer (CSLC 1998, p. 34). Major colonies of *R. subumbellata* occurring on beaches managed by public agencies have persisted over time because of actions taken by these agencies (see Factor D, Inadequacy of Existing Regulatory Mechanisms). However, because the continued existence of this species is dependent upon a metapopulation dynamic, it is essential that occupied and suitable unoccupied sites on both public and private lands be protected (Pavlik et al. 2002, pp. 6264, 7375, 9294).

Prospects for continued survival of *Rorippa subumbellata* on high-use beaches have been evaluated by examining available information on past and present recreational use of Lake Tahoes public beaches for indications of future trends. Sites occupied by *R. subumbellata* differ greatly in their level of recreational visitation. Visitation at five Nevada State Parks ranges between 750,000 and 1 million visitors per year (19892000), with similar levels at California State Parks and USFS lands in the basin (Pavlik et al. 2002, p. 42). Activities that encourage foot traffic along heavily visited beaches have the most deleterious impacts on R. subumbellata and its habitat (Pavlik et al. 2002, p. 42). Demands for beach recreation are expected to increase as a result of urban population growth in Nevada and on the western slope of the Sierra Nevada.

Visitation data are not available for privately-owned sites, but presumably the level of use is substantially lower than on publicly-managed sites. Approximately 42 percent of the populations of *Rorippa subumbellata* that have been monitored occur on privately-owned beaches, which in California are overlain by a public trust easement that permits beach use by the public where access is available. Much of the habitat on the private land sites is in good condition. However, some of these beaches are used for boat storage, and they are periodically raked by the property owners to provide a uniform surface for recreational activities; in the process larger pebbles, cobbles, boulders, and organic materials are removed. This practice may directly uproot seedlings and adult plants or indirectly degrade the habitat by altering substrate structure and moisture-holding capacity, both important habitat characteristics for *R. subumbellata* (CSLC 1998, pp. 3334; Pavlik et al. 2002, p. 11).

Development

Human-created disturbances in the shorezone of Lake Tahoe also contribute to the loss and degradation of *Rorippa subumbellata* and its habitat. Structures that extend into the water, such as boat launches, piers, and marinas, are a possible impediment to the natural transport of sand along the shoreline, which may decrease beach habitat; in addition, new construction and the ongoing maintenance of these structures also poses a direct threat to the habitat of the species (CSLC 1998, p. 33; Pavlik et al. 2002, p. 11). Lakeshore structures may also affect propagule transport which is important to the colonization of new sites and the recolonization of extirpated sites.

Summary of Factor A

Although *Rorippa subumbellata* appears well adapted to its dynamic shorezone environment and is capable of recolonizing sites after periods of inundation, future losses or degradation of potential habitat by water management and human threats may greatly affect the metapopulation dynamic upon which this species relies for its continued survival (Pavlik et al. 2002, p. 29). Though the effects of TROA were deemed to not be significant, extended periods of drought or wet conditions, out of the normal cyclic conditions, could have negative effects on *R. subumbellata*. Human threats from recreation and development remain during both high and low lake levels, though they may become more serious during periods of high lake level when fewer populations exist and trampling is more detrimental, especially on heavily used public beaches. On private beaches trampling is a lesser threat, but these beaches are often raked, which can uproot seedlings and adult plants, and they are used for boat storage which may impact habitat. A long-term, ongoing threat to the viability of the species is posed by the construction of piers, boat launches, and marinas which reduces or eliminates habitat and may interfere with the process of sand transport and lead to the erosion of the beach habitat on which the species depends, and may also affect propagule transport which is critical to the colonization of new sites and recolonization of extirpated sites. Ongoing periodic maintenance of such existing structures also has localized impacts to the species and its habitat.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

There is no evidence of threats to *Rorippa subumbellata* from commercial, recreational, scientific, or educational overutilization.

C. Disease or predation:

There are no known threats to *Rorippa subumbellata* from disease or predation.

D. The inadequacy of existing regulatory mechanisms:

Activities in the Lake Tahoe basin, including use of the shorezone on both public and private lands, are regulated under various Federal and State laws, as well as agency policies and management direction, many of which include provisions with varying levels of protection for *Rorippa subumbellata*.

Federal Protections

National Environmental Policy Act (NEPA)

The NEPA (42 U.S.C. 4371 *et seq*.) requires all Federal agencies to formally document and publicly disclose the environmental impacts of all actions and management decisions. NEPA documentation is provided in an environmental impact statement, environmental assessment, or categorical exclusion and may be subject to administrative appeal or litigation. The USFS complies with NEPA for actions requiring an environmental assessment, including many projects in or near *Rorippa subumbellata* habitat. Federal agencies are not

required to select the NEPA alternative having the least significant environmental impacts (e.g., beach management and development activities). A Federal agency may select an action that will adversely affect sensitive species provided that these effects were known and identified in a NEPA document.

Clean Water Act (CWA)

Under section 404 of the CWA, the U.S. Army Corps of Engineers (ACOE) regulates the discharge of fill material into waters of the United States, which include navigable and isolated waters, headwaters, and adjacent wetlands (33 U.S.C. 1344). In general, the term wetland refers to areas meeting the ACOEs criteria of hydric soils, hydrology (either sufficient annual flooding or water on the soil surface), and hydrophytic vegetation (plants specifically adapted for growing in wetlands). Any action with the potential to impact waters of the United States must be reviewed under the CWA, NEPA, and Endangered Species Act. These reviews require consideration of impacts to listed species and their habitats, and recommendations for mitigation of significant impacts. Since *Rorippa subumbellata* is a candidate species, the ACOE does not analyze effects to this species under these laws. However, for all shorezone permitting (e.g., boat launch, pier, and marina development) regarding *R. subumbellata* at Lake Tahoe, TRPA has established guidelines which the ACOE may include in some of their CWA permitting processes. These TRPA guidelines are discussed below.

National Forest Management Act (NFMA)

The NFMA (36 C.F.R. 219.20(b)(i)) requires the USFS to incorporate standards and guidelines into Land and Resource Management Plans, including provisions to support and manage plant and animal communities for diversity and for the long-term, rangewide viability of native species. Recent changes to the NFMA may affect future management of listed species, particularly rare plant occurrences, on National Forests. On January 5, 2005, the USFS revised National Forest land management planning under NFMA (70 FR 1023). The 2005 planning rule changed the nature of Land Management Plans so that plans generally would be strategic in nature and could be categorically excluded from NEPA analysis, and thus not subject to public review. Under the 2005 planning rule, the primary means of sustaining ecological systems would be through guidance for ecosystem diversity. If needed, additional provisions for threatened and endangered species could be provided within the overall multiple-use objectives required by NFMA. The 2005 planning rule did not include a requirement to provide for viable populations of plant and animal species, which was included in both the 1982 and 2000 planning rules. On March 30, 2007, however, the United States District Court in *Citizens for Better Forestry et al. v. USDA* (N.D. Calif.)enjoined (prohibited) implementation and use of the 2005 rule until the USFS provided for public comment and conducted an assessment of the rules effects on the environment, including listed species.

On April 21, 2008, the USFS published a final 2008 planning rule and a record of decision for a final environmental impact statement examining the potential environmental impacts associated with promulgating the new rule (73 FR 21468). The 2008 planning rule also did not include a requirement to provide for viable populations of plant and animal species on USFS lands. As part of the environmental analysis, a biological assessment was prepared to address the 2008 planning rules impact to threatened, endangered, and proposed species and designated and proposed critical habitat. The assessment concluded that the rule does not affect, modify, mitigate, or reduce the requirement for the USFS to conference or consult on projects or activities that it funds, permits, or carries out that may affect threatened, endangered, or proposed species or their designated or proposed critical habitat. On August 8, 2008, the USFS published an interim directive and requested public comment on the USFSs section 7 consultation policy for developing, amending, or revising Land Management Plans under the 2008 planning rule. Thus, the impact of the 2008 rule to address the present or threatened destruction, modification, or curtailment to the habitat and range of *Rorippa subumbellata* is unknown at this time. The USFS is still in the process of revising the 1988 Land and Resource Management Plan for the Lake Tahoe Basin Management Unit.

USFS Manual 2670 et seq.

Rorippa subumbellata is included on the list of USFS Sensitive Species for the Lake Tahoe Basin Management Unit (USFS 2011, p. 12); Sensitive Species are managed under Forest Service Manual 2670 *et seq.* Sensitive Species are defined as any species of plant or animal that has been recognized by the Regional Forester to need special management in order to prevent them from becoming threatened or endangered. The USFS, which manages about 27 percent of the known *R. subumbellata* sites, develops and implements management practices that ensure species do not become threatened or endangered as a result of their actions. Management activities for *R. subumbellata* on USFS lands have included annual surveys, construction of a number of protective enclosure fences around major occurrences, placement of informative signs on the enclosures and elsewhere to educate the public about the species, and transplanting programs. The commitment to such activities by the USFS is dependent upon annual funding and staffing and other priorities in the Lake Tahoe basin.

Tahoe Regional Planning Agency (TRPA)

The Tahoe Regional Planning Compact of 1969 (Public Law 96551), as revised, established the TRPA, a bi-State entity authorized to develop environmental threshold carrying capacities for the Lake Tahoe basin, which are to be achieved through the development of a regional plan and implementing ordinances. All applications for shorezone development are reviewed by TRPA to ensure that *Rorippa subumbellata* populations and habitats are not disturbed. Shorezone activities regulated by TRPA include construction of new structures (piers, jetties, breakwaters, boat ramps, boat houses, fences, buoys, shoreline protective structures, and marinas), modifications (major structural repair, reconfiguration, and expansions), and other activities including salvage operations, tour boat operations, waterborne transit, and seaplane operations.

Shorezone ordinances at Lake Tahoe have been managed under the 1987 TRPA Regional Plan. In 2006, TRPA released a Final Environmental Impact Statement on a proposed shorezone program that would amend the 1987 Regional Plan (TRPA 2006, entire). Amended ordinances were adopted on October 26, 2008, and took effect on December 22, 2008 (TRPA 2008, pp. 23). The new ordinances allowed an additional 138 piers, 1,862 buoys, 6 boat ramps, and 235 boat slips to be constructed by 2027 (TRPA 2008, pp. 23); new piers had previously been prohibited in prime fish habitat (TRPA 2008, p. 1). In the case *League to Save Lake Tahoe and Sierra Club v. TRPA* (No. 2:08-cv-02828-LKK-GGH), the plaintiffs filed a Complaint alleging that the adoption of TRPAs 2008 shorezone ordinances violated the Tahoe Regional Planning Compact and the implementing Code of Ordinances. In September 2010, the TRPAs 2008 shorezone amendments were ruled vacated (League to Save Lake Tahoe and Sierra Club v. TRPA 2010, pp. 6566); TRPA reverted to operating under the 1987 Regional Plan.

In June 2011, the Governor of Nevada signed Senate Bill (S.B.) 271 to withdraw Nevada from the Tahoe Regional Planning Compact unless amendments to the Compact are made by 2015. In addition, S.B. 271 created a deadline for TRPAs approval of a new Regional Plan of October 1, 2013 (Record-Courier 2011, p. 1; S.B. 271 2011, entire). As part of the Regional Plan update, TRPA has revised the Code of Ordinances effective March 1, 2012.

Rorippa subumbellata is addressed in the Resource Management and Protection chapters of the new Code of Ordinances which establishes standards to protect the natural environment in the Lake Tahoe basin. Under the new Code of Ordinances, all projects and activities that are likely to harm, destroy, or otherwise jeopardize *R. subumbellata* and its associated habitat must mitigate their significant adverse effects. Projects and activities that cannot fully mitigate their significant adverse effects are prohibited. Measures to protect *R. subumbellata* and its habitat include: (1) Fencing to enclose individual populations or habitat; (2) restrictions on access or intensity of use; (3) modifications to project design as necessary to avoid adverse impacts; (4) dedication of open space to include entire areas of suitable habitat; and (5) restoration of disturbed habitat (TRPA 2011, p. 6122). In addition, the TRPA has developed beach-raking guidelines, which discourage beach raking within known habitats of *R. subumbellata* (University of Nevada Cooperative Extension 2002, p. 64). Any activity that does not require a shorezone development permit (e.g., boat storage) is not regulated and discretionary guidelines (e.g., beack raking) cannot be enforced.

State Protections in California

California Endangered Species Act (CESA)

Rorippa subumbellata is listed as an endangered species by the State of California. The CESA of 1984 (California Fish and Game Code, section 2080 *et seq.)* prohibits the unauthorized take of State-listed threatened or endangered species. State agencies are required to consult with the California Department of Fish and Game (CDFG) on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes and to allow take that is incidental to otherwise lawful activities.

The California State Lands Commission (CSLC) administers the State's fee ownership to the bed of Lake Tahoe from 6,223 ft (1,897 m) elevation lakeward and a public trust easement between 6,223 ft (1,897 m) and 6,228.75 ft (1,898.52 m) elevation. Public and private entities must apply to CSLC for permits to construct marinas and other structures on State lands or waters. In consultation with CDFG, CSLC provides review under CEQA and CESA for discretionary projects in the shorezone and requires mitigation for all projects under their jurisdiction, but mitigation does not ensure the continued survival of individual populations.

Native Plant Protection Act (NPPA)

The NPPA of 1977 (California Fish and Game Code, sections 1900-1913) allows the CDFG to designate plants are rare or endangered. The NPPA prohibits take of endangered or rare native plants, but includes some exceptions for agricultural and nursery operations, emergencies, vegetation removal from canals, roads, and other sites, changes in land use, and in certain other situations (Division 2, Chapter 10, section 1908). A landowner wishing to exercise an exception simply notifies CDFG 10 days before beginning work and CDFG has 10 days to salvage affected listed plants.

California Environmental Quality Act (CEQA)

The CEQA of 1970 (California Public Resources Code § 21000 *et seq*.) requires review of any project that is undertaken, funded, or permitted by the State or a local governmental agency. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA section 21002). Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved.

California Code of Regulations Title 14 §4306

California State Park Laws were established to protect the park resources, to administer the parks, and to maintain the park atmosphere. Under California Code of Regulations Title 14 §4306, no person shall pick, dig up, mutilate, destroy, injure, disturb, move, molest, burn, or carry away any tree or plant, or any portion of it within California State Park boundaries. Violation is considered a misdemeanor (Cal. Code Regs. Tit. 14 §4306). In addition, the California Department of Parks and Recreation (CDPR) is required, under CEQA and CESA, to manage populations of *Rorippa subumbellata* on California State Park lands so as to ensure that their actions do not jeopardize the species. *Rorippa subumbellata* occurs at California State Parks (Emerald Bay, D.L. Bliss, and Sugar Pine Point) along Lake Tahoe in California.

State Protections in Nevada

Nevada Revised Statutes (N.R.S.) 527.260.300 and Nevada Administrative Code (N.A.C) 527.010

Rorippa subumbellata has been declared by the Nevada Division of Forestry (NDF) to be threatened with extinction pursuant to N.R.S. 527.260.300, and it was added to the State list of fully protected species of native flora (N.A.C. 527.010) in 1983. Removing or destroying plants on the States fully protected list is prohibited except under special permit issued by NDF (N.R.S. 527.270). The adequacy of this law, however, depends on informed and cooperative land managers, or on some form of deterrent enforcement, which the current law does not provide. It also depends on the NDF State Forester Firewardens discretion in issuing or withholding permits, and in placing protective conditions on permits that are issued. Nevada law does not mandate the continued survival of any plant species which it declares to be in danger of extinction.

N.R.S. 407.013 and 527.050

The Nevada Division of State Parks (NDSP) acquires, protects, develops, and interprets a well-balanced system of areas of outstanding scenic, recreational, scientific, and historical importance for the inspiration, use, and enjoyment of the people of the State of Nevada which are held in trust as irreplaceable portions of Nevadas natural and historical heritage (N.R.S. 407.013). It is unlawful to cut, destroy, mutilate, pick, or remove any flora on state lands. Violation is considered a public offense (N.R.S. 527-050). *Rorippa subumbellata* occurs at Lake Tahoe Nevada State Park (Hidden Beach, Cave Rock, and Sand Harbor areas) along Lake Tahoe in Nevada. The NDSP follows TRPA's Code of Ordinances (see above) to manage their shorezone areas (NDSP 2010, p. I5).

Summary of Factor D

While the States of California and Nevada provide some regulatory protection to *Rorippa subumbellata* through their endangered species statutes, these laws serve more to minimize impacts to the plant on private land than to avoid them. Agencies in each State have management programs for *R. subumbellata* and its habitat on lands under their management. However, there are impediments to conservation on public lands managed by the various agencies such as balancing conservation with development and use of recreational facilities, as well as reliability of allocations of funding and other resources. In particular, impacts from beach recreation are difficult to control due to costs associated with maintenance, as well as the differing degrees of recreational impacts associated with fluctuating lake levels. The TRPA has the most protective ordinance with respect to development impacts to *R. subumbellata* and its habitat, but the locations at which shorezone structures might be permitted to be built are unknown, especially if the location is a site where plant presence fluctuates. Moreover, some activities that may impact the species or its habitat, such as beach raking and boat storage, are not covered under existing regulatory mechanisms.

E. Other natural or manmade factors affecting its continued existence:

Stochastic events

Small populations like those of *Rorippa subumbellata* have a higher risk of extinction due to demographic and environmental uncertainty and natural catastrophes (Shaffer 1987, pp. 6975; Lande 1993, pp. 911927). An analysis of 693 R. subumbellata individuals from 28 sites revealed low levels of genetic variation (DeWoody and Hipkins 2004, entire). Thus, a single environmental or disease anomaly has the potential to eradicate the entire population since individuals are so genetically similar.

Climate Change

Our analyses under the Endangered Species Act include consideration of ongoing and projected changes in climate. The terms climate and climate change are defined by the Intergovernmental Panel on Climate Change (IPCC). The term climate refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007a, p. 78). The term climate change thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an

extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007a, p. 78).

Scientific measurements spanning several decades demonstrate that changes in climate are occurring, and that the rate of change has been faster since the 1950s. Examples include warming of the global climate system, and substantial increases in precipitation in some regions of the world and decreases in other regions. (For these and other examples, see IPCC 2007a, p. 30; and Solomon et al. 2007, pp. 3554, 8285). Results of scientific analyses presented by the IPCC show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate, and is very likely (defined by the IPCC as 90 percent or higher probability) due to the observed increase in greenhouse gas (GHG) concentrations in the atmosphere as a result of human activities, particularly carbon dioxide emissions from use of fossil fuels (IPCC 2007a, pp. 5-6 and figures SPM.3 and SPM.4; Solomon et al. 2007, pp. 2135). Further confirmation of the role of GHGs comes from analyses by Huber and Knutti (2011, p. 4), who concluded it is extremely likely that approximately 75 percent of global warming since 1950 has been caused by human activities.

Scientists use a variety of climate models, which include consideration of natural processes and variability, as well as various scenarios of potential levels and timing of GHG emissions, to evaluate the causes of changes already observed and to project future changes in temperature and other climate conditions (e.g., Meehl et al. 2007, entire; Ganguly et al. 2009, pp. 11555, 15558; Prinn et al. 2011, pp. 527, 529). All combinations of models and emissions scenarios yield very similar projections of increases in the most common measure of climate change, average global surface temperature (commonly known as global warming), until about 2030. Although projections of the magnitude and rate of warming differ after about 2030, the overall trajectory of all the projections is one of increased global warming through the end of this century, even for the projections based on scenarios that assume that GHG emissions will stabilize or decline. Thus, there is strong scientific support for projections that warming will continue through the 21st century, and that the magnitude and rate of change will be influenced substantially by the extent of GHG emissions (IPCC 2007a, pp. 4445; Meehl et al. 2007, pp. 760764 and 797811; Ganguly et al. 2009, pp. 1555515558; Prinn et al. 2011, pp. 527, 529). Other effects of climate change include, but are not limited to, changes in types of precipitation (Knowles et al. 2006, p. 4557), earlier spring run-off (Stewart et al. 2005, p. 1152), longer and more intense fire seasons (Chambers and Pellant 2008, pp. 3132), increases in exotic species invasions (Hawkins et al. 2008, p. 37; Bradley et al. 2010, pp. 310318), and more frequent extreme weather events (IPCC 2007b, p. 13).

Various changes in climate may have direct or indirect effects on species. Increasing temperatures and drought frequency could adversely affect *Rorippa subumbellata* by causing physiological stress and habitat loss, altering phenology, and reducing recruitment events and seedling establishment. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 814, 1819). Identifying likely effects often involves aspects of climate change vulnerability analysis. Vulnerability refers to the degree to which a species (or system) is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the type, magnitude, and rate of climate change and variation to which a species is exposed, its sensitivity, and its adaptive capacity (IPCC 2007a, p. 89; see also Glick et al. 2011, pp. 1922). There is no single method for conducting such analyses that applies to all situations (Glick et al. 2011, p. 3). We use our expert judgment and appropriate analytical approaches to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

Conservation Measures Planned or Implemented :

The CSLC and TRPA, in conjunction with various other Federal, State, and local partners, developed a stewardship plan which was intended to provide protection for *Rorippa subumbellata* so that shorezone development would not be detrimental to the species survival. Funds for this plan were to be derived from

mitigation fees assessed on permitted development projects located within the shorezone. The effort to develop the plan and fund its implementation was underway for a period of years, and various draft plans were produced; however, acquisition of funds to complete the plan, begin implementation, and identify management actions to protect the plant was never realized.

In 1997, CSLC formed a multi-agency survey team to perform annual lakeshore-wide surveys to determine the presence or absence of *Rorippa subumbellata*. Agencies involved in the effort contribute various in-kind services (watercraft, Global Positioning System (GPS) units, and aerial photographs) or post-survey data compilation (Pavlik et al. 2002, pp. 57). These surveys are ongoing, and the data collected continue to be refined so as to inform management decisions and conservation efforts.

The USFS, CTC, and CDPR have management programs for *Rorippa subumbellata*, which include monitoring, fenced enclosures, and transplanting efforts when funds and staff are available. For example, the CTC purchased the Barton property (Upper Truckee East) in 2001, which supports one of the largest occurrences of *R. subumbellata* (Pavlik et al. 2002, p. 6) and CDPR reestablished an extirpated population on Lester Beach at D.L. Bliss State Park through a program of outplanting, fencing, and monitoring (Pavlik et al. 2002, p. 5). Also, TRPA has developed beach-raking guidelines, which discourage this activity within known habitats of *R. subumbellata* (University of Nevada Cooperative Extension 2002, p. 64).

Once the Service elevated *Rorippa subumbellata* to candidate status, the AMWG, comprised of public agencies (including the Service), private landowners, and environmental groups, was convened in 1999 to develop a Conservation Strategy for *R. subumbellata* coupled with a Memorandum of Understanding/Conservation Agreement (MOU/CA) (Pavlik et al. 2002, entire; MOU 2003, pp. 18). Through the participation of academicians and scientists with expertise in rare plant conservation, this effort combined all of the data previously collected on *R. subumbellata* through the 2000 annual survey. This information was translated into goals and objectives for the strategy, and a research and monitoring agenda, and serves as the foundation for an adaptive management program. The Conservation Strategy and MOU/CA were completed and signed by the TRPA, Service, USFS, NDSP, NDSL, NDF, Nevada Natural Heritage Program, CDFG, CDPR, CTC, CSLC, League to Save Lake Tahoe, and the Tahoe Lakefront Owners Association in January 2003 with expiration in 10 years. All parties share responsibility in funding research and conservation activities, organizing and facilitating meetings, and participating in annual survey efforts. Funding has been secured in recent years through the Service, BOR, and the Southern Nevada Public Lands Management Act of 1998 (P.L. 105-263, as amended) as well as appropriated money to various other Federal, State, and local agencies (see below). Critical to the success of the Conservation Strategy is voluntary stewardship of private beaches on the lakefront. Currently, 14 conservation plans have been completed or are in progress, but the grant to fund these efforts ends in the summer of 2012 (AMWG 2011, pg. 1; AMWG 2012, p. 4).

The Conservation Strategy indentifies six primary goals: (1) Protect occupied habitat and potentially suitable habitat that does/could support natural populations; (2) improve *Rorippa subumbellata* populations; (3) promote conditions that favor a positive metapopulation dynamic; (4) conduct research that directly supports management and restoration; (5) revise and continue the monitoring program for *R. subumbellata*; and (6) implement an interagency adaptive management framework (Pavlik et al. 2002, pp. 6572). Goal 1 has been partially implemented via some protection measures on private and public land. Permanent or temporary fenced enclosures are present at nine sites on public lands and one site on private land (BMP Ecosciences 2009, p. 26). Completion of Goal 1 remains elusive for reasons discussed above under Factor D. Goal 2 has been implemented through experimental reintroduction and outplantings which have included the greenhouse propagation of *R. subumbellata*, the installation of container grown plants at sites around the lake, and translocation of plants from one location to another (BMP Ecosciences 2010, pp. 3642). Goal 3 has not been achieved because limitations on access to private land have precluded the random survey previously thought necessary to assess the metapopulation dynamic. An alternative approach to establishing the metapopulation dynamic and dispersal strategy, using genetic markers, was submitted but not funded through the 2011 Request for Proposals for the Services Section 6 grant process in California (Peacock 2011, pp. 111). Goals 4, 5, and 6 have been successfully implemented.

Other recent accomplishments under the Conservation Strategy include: the production and distribution of a brochure to educate the public about *Rorippa subumbellata* conservation; completion of research to determine the optimal time to plant container-grown specimens and whether outplants of container-grown plants and translocation of naturally-occurring plants have similar success rates; and the launch of a website for public outreach (www.tahoeyellowcress.org) (BMP Ecosciences 2010, p. 26). In addition, a detection probability assessment was conducted comparing detection rates while walking on the beach to detection rates while walking or floating in a kayak at the waters edge (BMP Ecosciences 2010, pp. 56). Also, over 2,000 leaf samples were collected from 51 sites for genetic analysis to assess the metapopulation dynamics of the species; analysis is pending funding (BMP Ecosciences 2010, p. 25). Finally, the *R. subumbellata* Stewardship Plan has been developed as a cooperative effort between NRCS, NTCD, Tahoe Resource Conservation District (Tahoe RCD), and the AMWG. The plan provides private landowners information on voluntary conservation practices to protect *R. subumbellata* on their property. As mentioned above, 14 conservation plans are in progress, but additional funding is needed to continue the program (AMWG 2011, pp. 14).

Southern Nevada Public Land Management Act (SNPLMA)

The SNPLMA (Public Law 105263, as amended) became law in October 1998. It allows the Bureau of Land Management to sell public land within a specific boundary around Las Vegas, Nevada. The revenue derived from land sales is split between the State of Nevada General Education Fund (5 percent), the Southern Nevada Water Authority (10 percent), and a special account available to the Secretary of the Interior for: (1) Parks, trails, and natural areas; (2) capital improvements; (3) conservation initiatives; (4) multi-species habitat conservation plans; (5) environmentally sensitive land acquisitions; and (6) Lake Tahoe Restoration Act projects.
Several rounds of funding from SNPLMA have been awarded to support *Rorippa subumbellata* conservation. The Round 6 award of $350,000 to the USFS allocated $200,000 for contracting and $150,000 to support USFS staff time and other products. The USFS awarded a contract for $109,950 of the Round 6 funds to BMP Ecosciences in April 2007 to support research and AMWG participation that was completed in early 2009. A second contract for $81,000 in remaining Round 6 funds was awarded to BMP Ecosciences in April 2008 to continue with research and additional AMWG-specified tasks. A Round 7 SNPLMA award of $150,000 to the USFS specified $50,000 for contracting with the remainder for USFS use. The USFS awarded $50,000 of Round 7 funds to Dr. Mary Peacock, University of Nevada Reno, to conduct microsatellite DNA analysis. The Natural Resources Conservation Service (NRCS) received two awards of $45,000 each in Rounds 8 and 9 to provide technical support to private property owners and help to develop site-specific plans for *R. subumbellata* conservation. Finally, the USFS received a Round 9 award of $120,000, of which $20,000 was awarded to BMP Ecosciences to continue AMWG participation, coordinate the annual survey, and report on *R. subumbellata* data from late 2010 through 2011 (BMP Ecosciences 2011, p. 6).

Summary of Threats :

Although *Rorippa subumbellata* appears well adapted to its dynamic shorezone environment and is capable of recolonizing sites after periods of inundation, future losses or degradation of potential habitat by water management and human threats may greatly affect the metapopulation dynamic upon which this species relies for its continued survival (Pavlik et al. 2002, p. 29). The amount of available habitat varies with the level of Lake Tahoe and the amount of water that can be stored in Lake Tahoe is greatly influenced by snowpack. Periods of low precipitation have regularly caused the lake level to drop, even below the natural lake rim during extended droughts. An adjustment to the management of stored water behind Lake Tahoe Dam is dependent on the implementation of TROA. Though the effects of TROA were deemed to not be significant, extended periods of drought or wet conditions, out of the normal cyclic conditions, could have negative effects on *R. subumbellata*. At this time, the most significant threat to *R. subumbellata* is recreational activities on public beaches and adjacent habitat around the shore of Lake Tahoe. Less significant than recreational activities but, nevertheless, real threats are posed by shorezone development and

maintenance activities on private lands. A conservation strategy has been developed and is being actively implemented by numerous Federal, State, and local agencies to address the threats to *R. subumbellata*. An annual monitoring plan is in place, and propagation, transplanting, and translocation strategies have been examined. Further research on the genetics and population dynamics of this species has been proposed. At this time, methods have been identified to mitigate many threats but, until the protocols have been developed to mitigate losses from individual projects through population enhancement or establishment of new populations, the removal of this species from candidacy is premature. In addition, many core populations occur on private land and a combined NRCS, NTCD, Tahoe RCD, and AMWG planned stewardship program has been implemented, but needs additional funding to continue.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

Continued implementation of the conservation strategy, including funding the private land stewardship program and research and monitoring program, is recommended at this time. Public outreach and fence construction and maintenance should continue on public beaches, especially during high lake level years when less habitat is available.

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	**Imminent**	Monotypic genus	7
		Species	**8**
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

Despite the relatively high number of populations observed during the recent low lake level surveys, we still have concern over increasing and intense recreational use and further development of the shorezone at Lake Tahoe. However, because of the continued commitments to conservation demonstrated by regulatory and land management agencies participating in the conservation strategy, the magnitude of threats is moderate to

low. The Tahoe Lakefront Owners Association is supporting education and engagement of private landowners around the Lake Tahoe basin regarding the importance of conserving this endemic species. While regulatory agencies that oversee activities in the basin continuously receive permit applications for the construction, repair, and maintenance of boat launches, piers and revetments, and other development that alters the shorezone, integration of the terms of the conservation strategy into permit requirements is expected to continue to increase awareness and protection for the species. Successful implementation of the conservation strategy is necessary to keep the threats from recreation and development in check and allow the Service to reassess the LPN for *Rorippa subumbellata*. Efforts to minimize or eliminate impacts to this species and its habitat are ongoing through implementation of this conservation strategy. In the future, if we determine the ongoing management and conservation activities have adequately reduced or eliminated the threats to the species, the removal of *R. subumbellata* as a candidate species will be considered.

Imminence :

Threats to *Rorippa subumbellata* from various land uses such as recreational activities are currently ongoing, particularly when high lake levels concentrate use in exposed high beach habitat. Lake levels in 2009 and 2010 were low, but rose again in 2011 to 6,228.4 ft (1,898.4 m). This was 3.8 ft (1.2 m) higher than in 2010, and plants were present at only 25 of the 59 sites surveyed. If lake levels are high again in 2012, increased pressure on *R. subumbellata* from ongoing recreational activities will constitute an imminent threat.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

As previously discussed, the ongoing and effective implementation of the Conservation Strategy for Tahoe Yellow Cress (*Rorippa subumbellata*) (Pavlik et al. 2002, entire) has demonstrated a commitment among regulatory and land management agencies and private landowners to actively protect this species into the future.

Description of Monitoring:

Various surveys and studies of *Rorippa subumbellata* have been conducted on the beaches around Lake Tahoe since 1979. Many historical locations of *R. subumbellata* have been well documented, providing long-term presence-absence data for the region (Knapp 1979b; pp. 17; 1980, pp. 110; Ferreira 1987, pp. 1335; CSLC 1998, pp. 1162; 2002 pp. 127; Service 2004, 128; BMP Ecosciences 2004, pp. 145; 2005, pp. 181; 2006, pp. 184; 2007, pp. 180; 2008, pp. 180; 2009, pp. 187; 2010, pp. 164; 2011, unpubl. data). However, inconsistencies in survey methods over the years (non-consecutive survey years, incomplete surveys, and variable sampling methodology) have made direct comparisons of data difficult. Also, the naming convention of the sites has been an issue over the years. Therefore, an effort was made prior to the 2003 survey to reconcile site names with previous years data. As a result, some sites were combined and some were separated based on the presence of protective enclosure fences.

As part of the conservation strategy, a protocol was developed and implemented that included a census of known populations and systematic searches of areas supporting unoccupied, potentially suitable habitat (Pavlik et al. 2002, entire). Beginning in 2001, the annual survey was designed to expand on previous efforts through the collection of data on habitat variables that would assist in determining the distribution patterns and abundance of *Rorippa subumbellata*. The annual survey includes collection of information on occurrence size, number of stems, and other habitat characteristics. In 2010, *R. subumbellata* annual survey protocols were modified based on lake level, but still were in accordance with measures outlined in the conservation strategy (Pavlik et al. 2002, pp. 7172, 9596). *Rorippa subumbellata* monitoring now is linked to lake level. At

lake level 6,226 ft (1,897.86 m) and above, monitoring will occur annually; below 6,226 ft (1,897.86 m), surveys will be conducted every other year. Thus in 2010, an annual survey was not conducted due to low lake levels in 2009, but conducted once again in 2011 because lake levels rose. Survey protocols and the annual survey data form have been standardized as of 2001 and all identified sites will be surveyed using these methods in years when the survey is conducted.

The annual (or biannual) lake-wide survey for *Rorippa subumbellata* is consistently conducted during the week following Labor Day in early September. Participants typically include staff from the TRPA, Service, USFS, NDSP, NDF, CDFG, CDPR, CTC, and CSLC. Participants are divided into teams that survey the known, historical, and potential habitat sites by covering the entire width of the beach from waters edge to the high water line. Land use (type and disturbance) and search effort are recorded at both occupied and unoccupied sites. Search effort is defined as the amount of person minutes spent actively searching for and collecting data on *R. subumbellata*. Site boundaries are delineated using GPS technology and are generally defined either by natural (river mouth or substrate change) or artificial features that restrict the surveyors movement around the lakeshore (changes in ownership, jetties, and fences).

For sites supporting *Rorippa subumbellata*, surveyors estimate general habitat parameters across the entire site, with GPS data obtained for each cluster of plants within the site boundaries. To better characterize the occupied habitat, the physical and biological attributes are recorded for each individual cluster. A cluster is defined as a group of plants that occur within 21 ft (6.5 m) diameter of each other. This distance equates to the resolution capability for point data using handheld GPS units. Information specific to each cluster is also collected including the actual or estimated number plants, actual or estimated of plants in each phenological stage, and minimum and maximum rosette diameter. Additional physical and biological attributes are recorded for each cluster including slope, distance to lake, substrate/soil cover, and percent cover of associated plant species. These data are compiled and maintained by the Nevada Natural Heritage Program (*http://heritage.nv.gov/vlibtyc.htm*).

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

California,Nevada

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

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Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  05/30/2013
Date

Concur:  10/28/2013
Date

Did not concur: _____ _____
Date

Director's Remarks: